

Leguminous plants, whether first used as fodder for animals or simply left to decay in the soil, have their albumen changed in the first instance to amides, which under the influence of ammonia-ferments are decomposed with formation of ammonium-carbonate. The saltpetre bacillus then converts the ammonium-carbonate (and probably also amides) into saltpetre, *i.e.* into the best form of nitrogen plant-food.

Unfortunately the whole of the nitrate thus formed is never available for plants, on account of the destructive action of the nitrate-destroying bacilli, which decompose the nitrates with evolution of free nitrogen, and so complete the nitrogen cycle.

The nitrate destroyers are usually present in stable-manure, and cause a deplorable loss to agriculture, amounting in Germany to a sum of several million pounds annually.

Efforts which, as Prof. Maercker assured the German Chemical Society, are likely to meet with success at an early date, are being made to avoid this loss; and for this purpose special bacteriological investigations are now being conducted at many agricultural stations in Germany.

### UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

CAMBRIDGE.—Dr. Langley, F.R.S., has been appointed Chairman of the Examiners for the Natural Sciences Tripos.

Mr. E. A. N. Arber, of Trinity, has been appointed Demonstrator in Palæobotany.

Mr. W. F. Cooper, of Clare, has been nominated to the occupation of the University table in the Naples Zoological Station.

Mr. H. H. W. Pearson, of Gonville and Caius, and Mr. J. Barcroft, Fellow of King's, have been awarded the Walsingham medals for research in botany and in physiology, respectively.

The degree of Master of Surgery was on November 23 conferred on Mr. Timothy Holmes for his distinguished contributions to the art and science of surgery.

Sir Ernest Clarke has been re-appointed Gilbey Lecturer in Agricultural History and Economics for the ensuing year.

Prof. Woodhead, and Drs. Anningson, Collingridge, Notter, and Stevenson, have been appointed Examiners in State Medicine.

Dr. Somerville, Professor of Agriculture, has been elected a Fellow of King's College.

THE Lawrence Scientific School of Harvard University has received a gift of twenty thousand dollars to be used to equip the mining and metallurgical laboratories.

DR. PAUL STAECKEL, assistant professor of mathematics at Kiel, has been appointed professor ordinarius. Dr. J. Traube, privatdocent in physical chemistry at the Berlin Technical High School, has been appointed professor.

THE new leather industries buildings in connection with the Yorkshire College, Leeds, which have been erected by the Skinners' Company of London at a cost of 5000*l.*, were opened on Monday by the Master of the Guild, Mr. J. Colman. In addition to the gift of the buildings the Company has granted an endowment of 250*l.* a year for ten years, thus placing the instruction in the branches connected with the leather industry on a solid foundation.

THE Canadian *Educational Review* announces that Sir W. C. McDonald, of Montreal, whose magnificent gifts to McGill University have made him justly celebrated as a public benefactor to education in Canada, has placed in the hands of Prof. Robertson, Dominion Agricultural Commissioner, sufficient funds to establish for three years technical schools in various centres throughout the Dominion. The nature of the plan is to take one city or town in each province in which to establish regular classes in some of the ordinary schools on one or two days a week, in which scholars between nine and thirteen years of age shall spend a portion of the day in actual work with tools. This will be supplemented whenever desired by more advanced and special evening classes in manual training and technical instruction.

A COPY of the *Magnet*, the magazine of University College, Bristol, has been received. There are several noteworthy articles and items of information in the magazine, not the least

interesting being the editorial note on the appointment of Dr. Ryan, professor of engineering, to the principalship of the Woolwich Polytechnic. Dr. Ryan has been at the College for fourteen years, and has devoted his best energies to bringing the engineering department to its present satisfactory position. He would have done much more if the funds at his disposal had permitted him to develop the work of the department; but, unfortunately, the College possesses only a small endowment, and Bristol manufacturers are not so actively interested in the progress of their University College as are many commercial men in Liverpool, Birmingham, and other cities. Leaving this point, attention may be called to an article in the *Magnet* on life in a mediæval university, by Dr. Hastings Rashdall. The description of the ceremonies through which the freshman or bejannus of the middle ages had to pass before he could call himself a student of the university would suggest many comparisons to an ethnologist. It must be remarked that the periodical does not show the signs of active interest in scientific work which are given in the form of notes and articles in some other magazines of the same type.

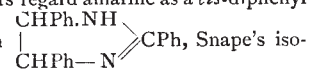
### SOCIETIES AND ACADEMIES.

LONDON.

**Physical Society**, November 24.—Prof. G. Carey Foster, F.R.S., Vice-President, in the chair.—A paper on the conductivities of certain heterogeneous media for a steady flux having a potential was read by Dr. C. H. Lees. Two formulæ have already been proposed to express the conductivity of a mixture in terms of the conductivities of its constituents. In the first formula the conductivity is represented as the sum of a number of terms, each one of which is the product of the conductivity of any constituent and the fractional part of the mixture which is made up of that constituent. In the second formula the resistivity of a mixture is expressed in the same way with respect to the resistivities and percentages of its constituents. In general, the first of these suppositions gives results which are above the experimental values, while the second gives results which are below. If we suppose that the mixture is made up of a series of columns of the separate parts stretching normally between two equipotential surfaces, then the conductivity would be accurately represented by the first formula. If, however, we assume that the constituents are arranged in parallel layers, then the second formula would apply. In the present paper the author has attacked the problem two-dimensionally, and has investigated the relation which holds between the conductivities, when the constituents are arranged in the mixture alternately like the squares on a draughts board. Dealing first with two components it is easily shown that the problem reduces itself to finding the form of the equipotential curves and of the stream lines in a square which is divided by a diagonal into two parts of different material. By means of conformal representation Dr. Lees has referred the square under consideration to a kite-shaped quadrilateral with two opposite angles right angles, and the other two so determined by the conductivities of the constituents as to give straight equipotential lines in the two portions of the figure which represent the two materials and which are separated the one from the other by the axis of symmetry. The general relation which exists between the vector co-ordinates in the two systems has been proved by Love to consist of elliptic functions; but near the angular points of the figures a close approximation can be obtained by the use of a simple exponential expression. Taking the known solution to the problem in the case of the kite-shaped quadrilateral, it is easy to calculate the result for the square under consideration. This leads to the conclusion that the conductivity of the square is the geometric mean of the conductivities of the constituents. Allowing the medium to become fine-grained and introducing new materials, it follows at once that the logarithm of the conductivity of a mixture is equal to the sum of a number of terms, each one of which is the product of the logarithm of the conductivity of any constituent and the fractional part of the mixture which is made up of that constituent. By a superposition of fluxes, the author has shown that the above law holds for flows in four directions, and he therefore considers that with the assumed structure the formula represents the conductivity for any flux.—Dr. Lees then read a second paper on the thermal conductivities of mixtures and their constituents.

In this paper the three formulæ considered in the preceding communication are applied to the known experimental results upon the conductivities of mixtures of liquids. The author finds that the least satisfactory formula is the first one, whereas the least unsatisfactory is the logarithmic one. Mr. Appleyard said that it was frequently of importance to be able to determine the resistance of a mixture of gutta-percha from the known resistances of component parts. He had attempted, without success, to do this by means of the old formulæ, and he would be interested to see whether Dr. Lees' logarithmic formula gave better results. In electrical work Mr. Appleyard pointed out that the nature of the contacts affected the conductivity, the resistance of a sheet of rubber being different when measured between metal plates and mercury sheets. Mr. Campbell said that the difference between the calculated and observed results might be due to the thermoelectric properties of the materials. Lord Rayleigh had observed that the high resistivity of alloys might be due to a back E.M.F. produced by the contact of dissimilar metals. Mr. Campbell said that he had measured the resistances of ferro-nickels both with direct and alternating currents, and found them the same in the two cases. In reply, Dr. Lees said that all his experimental work on conductivity had been carried out with mercury contacts.—The Society then adjourned until December 8, when, by the invitation of Prof. S. P. Thompson, the meeting will be held in the Physical Laboratory of the Finsbury Technical College.

**Chemical Society**, November 16.—Prof. Thorpe, President, in the chair.—The following papers were read.—The chlorine derivatives of pyridine. Part IV. The constitution of the tetrachloropyridines, by W. J. Sell and F. W. Dootson. The authors have determined the constitutions of the three known and theoretically possible tetrachloropyridines.—Contributions to our knowledge of the aconite alkaloids. Part XV. On japaconitine and the alkaloids of Japanese aconite, by W. R. Dunstan and H. M. Read. The authors show that Japanese aconite, *A. Fischeri* ("Kuzo uzu"), contains japaconitine,  $C_{21}H_{29}(OMe)_4(OCMe)(OCPh)NO_3$ , which, contrary to the views of many investigators, is chemically distinct from aconitine.—The dissociation constants of very weak acids, by J. Walker and W. Cormack. Using a special form of apparatus, the authors have determined the electrical conductivity of solutions of feebly acid substances, such as phenol, hydrogen sulphide and acetic, carbonic, boric and hydrocyanic acids; the behaviour observed is in accordance with Ostwald's dilution law.—Preparation and properties of solid ammonium cyanate, by J. Walker and J. K. Wood. Pure solid ammonium cyanate may be obtained by mixing cooled ethereal solutions of ammonia and cyanic acid; its molecular heat of transformation into solid urea is 49 K, whilst in aqueous solution this constant is 75 K.—Etherification of derivatives of  $\beta$ -naphthol, by W. A. Davis.—On the determination of transition temperatures, by H. M. Dawson and P. Williams. The authors' method of determining transition temperatures depends upon ascertaining the point at which the two branches of the density or electrical conductivity curves at temperatures above and below the transition point, intersect each other.—Constitution of amarine, of its supposed dialkyl- and diacyl-derivatives and of isoamarine, by F. R. Japp and J. Moir. The authors regard amarine as a *cis*-diphenyl compound of the constitution



amarine being the corresponding *trans*-isomeride; the latter is readily obtainable by fusing amarine with sodium or heating its hydrochloride above the melting point.—The atomic weight of nitrogen, by G. Dean. The ratio  $\text{Ag} : \text{AgCN}$  was found to be 107.93 : 133.962, whence  $\text{CN} = 26.032$  and  $\text{N} = 14.031$  if  $\text{C} = 12.001$ .

**Mineralogical Society**, November 14.—Prof. A. H. Church, F.R.S., President, in the chair.—Dr. E. Hussak and Mr. G. T. Prior gave an account of a new Brazilian mineral, Florencite, a hydrated phosphate of aluminium and cerium earths ( $3\text{Al}_2\text{O}_3 \cdot \text{Ce}_2\text{O}_3 \cdot 2\text{P}_2\text{O}_5 \cdot 6\text{H}_2\text{O}$ ), crystallising in the rhombohedral system. The mineral is isomorphous with the recently discovered Hamlinite, to which it is also very similar in chemical composition; the strontium and barium of Hamlinite being replaced in Florencite by cerium earths.—Mr. A. Hutchinson described a new mineral, Stokesite, from Cornwall, of peculiar chemical composition. It is a hydrated silicate of tin and calcium,  $\text{CaO} \cdot \text{SnO}_2 \cdot 3\text{SiO}_2 \cdot 2\text{H}_2\text{O}$ , and crystallises in the orthorhombic system in forms closely resembling gypsum, from which

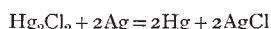
it is easily distinguished by its much greater hardness.—Mr. R. H. Solly contributed a paper on sulpharsenites of lead from the Binnenthal, and gave descriptions of the crystallographic characters of the rare minerals, Rathite and Jordanite. Analyses made by Mr. H. Jackson gave to Jordanite the ordinary formula,  $4\text{PbS} \cdot \text{As}_2\text{S}_3$ , and to Rathite the formula,  $3\text{PbS} \cdot 2\text{As}_2\text{S}_3$ .—Mr. L. J. Spencer described complex twinned crystals of Stannite on specimens from Bolivia collected by Sir Martin Conway. The crystals appear to be tetragonal, with crystal element close to that of copper-pyrites. The analysis by Mr. G. T. Prior tends to confirm the usually accepted formula.

**Royal Meteorological Society**, November 15.—Mr. F. C. Bayard, President, in the chair.—Mr. R. H. Curtis read a paper on the diurnal variation of the barometer in the British Isles. The principal features of a curve exhibiting the diurnal march of barometrical pressure are two minima and two maxima—the first minimum occurring early in the morning and the second in the afternoon, while the first maximum falls in the forenoon and the second not far from ten o'clock in the evening. In the tropics the oscillation may amount to as much as a tenth of an inch, but its amplitude decreases as the latitude increases, and the greatest amplitude in the British Isles amounts to not much more than three-hundredths of an inch. The author discusses the mean hourly readings of the barometer from twenty-five years' observations, 1871–95, at four observatories maintained by the Meteorological Council, viz. Kew, Aberdeen, Falmouth and Valencia. The author is of opinion that the primary cause of the diurnal oscillation of the barometer is solar radiation, and that its amplitude is chiefly determined by the temperature of the lower strata of the atmosphere. The relative magnitudes of the different phases of the barometer oscillation, as observed, depend largely upon the geographical position and physical surroundings of the place of observation, in so far as these are capable of modifying its temperature conditions, and especially the relative distribution of temperature over the regions immediately surrounding it.—Mr. G. J. Symons, F.R.S., described some experimental observations which he made during the hot weather in July with two thermometers one foot below the surface of the ground, with the view of ascertaining (1) the influence of slight shade, (2) the amount of daily range, and (3) the approximate curve of daily fluctuation.

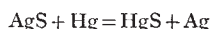
#### PARIS.

**Academy of Sciences**, November 20.—M. van Tieghem in the chair.—Note on the Leonids, by M. Leewy. An account of the results obtained in various French observatories on the Leonid swarm. The results were disappointing. At Paris only thirty-three Leonids were seen on three nights; at Algeria, sixty-five in two nights; at Lyons, forty during three nights; at Toulouse, forty-three. The most favourable conditions for observations appear to have existed at Marseilles, where twenty shooting stars were seen on the night of the 13th, seventy-one on the 14th, and forty-three on the 15th, or 134 in all.—Note on the observations of the shooting stars known as the Leonids, made at the Observatory of Meudon, by M. J. Janssen. In order to prevent the possible interference of clouds or fog with the observations, two balloons were employed, at an altitude of about 200 metres. Full details will be given in a later paper.—On the course of a system of plane waves, laterally indefinite, moving in an isotropic heterogeneous medium, formed of plane parallel layers, by M. J. Boussinesq.—Action of fluorine and hydrofluoric acid upon glass, by M. Henri Moissan. The statement of Louyet, that anhydrous hydrofluoric acid does not attack glass is shown to be based upon a misconception, since although under certain conditions glass maintains its polished surface in contact with hydrofluoric acid, it can be shown to have been attacked by its loss of weight. In the present experiments glass was invariably found to be attacked at the ordinary temperature by gaseous hydrofluoric acid, even although very carefully dried. In the first experiments made with fluorine, a similar effect was observed; but this was afterwards found to be due to the presence of a minute trace of hydrofluoric acid. Pure fluorine, freed from traces of acid by passing through a V-tube cooled in liquid air, may be kept in sealed glass bulbs for weeks without the glass being attacked.—Observations of the Leonid swarm of November 13 to 16, 1899, made at the Observatory of Paris, by M. G. Bigourdan.—Observations of Leonids at the Observatory of Toulouse, by M. Baillaud.—Observation of the Leonid swarm at the Observatory of Meudon, by M. H. Deslandres.—Observations of the

new planets (E W) and (E R) made at the Observatory of Algiers with the 31.6 cm. equatorial, by MM. Rambaud and Sy.—Observations of the sun made at the Observatory of Lyons during the second quarter of 1899, by M. J. Guillaume. The results are collected in three tables, showing the number and area of spots, distribution of the spots in latitude, and of the faculae in latitude.—Contribution to the theory of the function  $\zeta(s)$  of Riemann, by M. Edm. Landau.—On systems simultaneously isolated, by M. Andrade.—A new theory of the optical phenomena of the entanglement of ether by matter, by M. G. Sagnac.—On a new binocular lens, by M. Émile Berger.—Chemical effects produced by the Becquerel rays, by M. P. Curie and Mme. Curie. Radio-active barium chloride possesses the property of converting oxygen into ozone. This necessitates an expenditure of energy, and hence is a proof that the radiation represents a continual disengagement of energy.—Reciprocal displacement of metals, by M. Alb. Colson. The disturbing effects of oxygen and occluded gases were eliminated in these experiments by working in a Crookes vacuum. It was found that the reactions



and



are reversible, the reaction being limited by a definite pressure of mercury vapour for a given temperature.—Action of nitric oxide upon chromic dichlorhydrin, by M. V. Thomas. Nitric oxide combines vigorously with chromyl dichloride, giving an amorphous compound, the results of the analysis of which can be best expressed by  $\text{Cr}_2\text{Cl}_5\text{O}_7 \cdot 2\text{NO}_2$ .—On a methylene sulphate, by M. Marcel Delépine. By the interaction of dry trioxymethylene and fuming sulphuric acid, a neutral crystallised substance,  $\text{CH}_2\text{O} \cdot \text{SO}_3$ , is obtained, thermochemical data for which are given.—On a mode of synthesis of parabanic acid, by M. P. Cazeneuve. Oxamide added to boiling phenyl carbonate gives parabanic acid and phenol, the acid being identified by means of its silver salt. The yields do not exceed 5 per cent. of the oxamide employed.—On a new Myxosporidium, *Nosema Stephani*, a parasite of *Flesus passer*, by M. Hagenmuller.—On the cytological phenomena preceding and accompanying the formation of the teleutospore in *Puccinia Lillicearum*, by M. R. Maire.—On the histological modifications produced in stems by the action of *Phytoptus*, by M. Marin Molliard. The chemical action which corresponds to the presence of parasites such as *Phytoptus* determines the formation of a new tissue which differentiates itself at the expense of any cells, independently of what these cells would have become in the ordinary course of development.—On the negative variation of the axial nervous current, by M. Mendelssohn.—The cryoscopy of urine as an aid to diagnosis, by MM. H. Claude and V. Balthazard.—Effect of a diet poor in chlorides upon the treatment of epilepsy by sodium bromide, by MM. Ch. Richet and Ed. Toulouse. The use of sodium bromide in the treatment of epilepsy, although efficacious to a certain extent, leads to other troubles owing to the large doses necessary, 8 to 15 grams per day. By the use of a diet as free as possible from salt, equally good effects were produced with only 2 to 4 grams of sodium bromide daily. The special diet appears to have no effect upon the general nutrition.

## DIARY OF SOCIETIES.

THURSDAY, NOVEMBER 30.

ROYAL SOCIETY, at 4.—Anniversary Meeting.

INSTITUTION OF CIVIL ENGINEERS, at 8.—Bridges for Light Railways: L. H. Rugg.

FRIDAY, DECEMBER 1.

GEOLOGISTS' ASSOCIATION, at 8.—The Zones of the White Chalk of the English Coast. I. Kent and Sussex: Dr. A. W. Rowe.—A New Rhetic Section at Bristol: W. H. Wickes.

MONDAY, DECEMBER 4.

SOCIETY OF ARTS, at 8.—Enamelling upon Metals: H. H. Cunynghame. SOCIETY OF CHEMICAL INDUSTRY, at 8.—The Fireproofing and Preserving of Timber: Sherard Cowper-Coles.

VICTORIA INSTITUTE, at 4.30.—Pictorial Art among the Australian Aborigines: R. H. Mathews.

TUESDAY, DECEMBER 5.

INSTITUTION OF CIVIL ENGINEERS, at 8.—Paper to be further discussed: The Waterloo and City Railway, and its Electrical Equipment.—Paper to be read with a view to discussion: Combined Refuse-destructors and Power-plants: C. Newton Russell.

WEDNESDAY, DECEMBER 6.

SOCIETY OF ARTS, at 8.—Artificial Silk: Joseph Cash. GEOLOGICAL SOCIETY, at 8.—On the Occurrence in British Carboniferous Rocks of the Devonian Genus *Palaeoneilo*, with a Description of the Species *Palaeoneilo carbonifer*: Dr. Wheelton Hind.—On the Geology

and Fossil Corals and Echinids of Somaliland: Dr. J. W. Gregory.—Note on Drift-gravels at West Wickham, Kent: G. Clinch.

SOCIETY OF PUBLIC ANALYSTS, at 8.—Note on Asafoetida: C. G. Moor.—On some Analyses of Modern Dry Champagne: Dr. P. Schidrowitz and Dr. Otto Rosenheim.—On the Determination of the Iodine Value: Dr. J. J. A. Wijs.—Treacle or Golden Syrup: E. W. T. Jones.—On a Method for Distinguishing between Hops and Quassia: Alfred C. Chapman.

ENTOMOLOGICAL SOCIETY, at 8.

THURSDAY, DECEMBER 7.

ROYAL SOCIETY, at 4.30.—Probable Papers: Vapour-density of Bromine at High Temperatures: Dr. E. P. Perman and G. A. S. Atkinson.—Polytremacis and the Ancestry of Helioporidæ: Dr. J. W. Gregory.—Gold Aluminium Alloys: C. T. Heycock, F.R.S., and F. H. Neville, F.R.S.—On the Association Attributes in Statistics; with Examples from the Material of the Childhood Society, &c.: G. U. Yule.—Data for the Problem of Evolution in Man. III. On the Magnitude of certain Coefficients of Correlation in Man, &c.: Prof. Karl Pearson, F.R.S. INSTITUTION OF ELECTRICAL ENGINEERS, at 8.—The Cost of Steam Raising: John Holliday.—Influence of Cheap Fuels on the Cost of Electrical Energy: R. E. Crompton. (Adjourned Discussion.)

LINNEAN SOCIETY, at 8.—On some Vegetable Poisons used for the Capture of Fish by the Australian Aborigines: J. W. Fawcett.—On some New Zealand Schizopoda: G. M. Thomson.—On the Structure of Porites: H. M. Bernard.

CHEMICAL SOCIETY, at 8.—Ballot for the Election of Fellows.—The Oxidation of certain Organic Acids in presence of Iron: H. J. H. Fenton, F.R.S., and H. O. Jones.—The Determination of the Constitution of Fatty Acids, Part II.: Dr. A. W. Crossley and H. R. Le Sueur.—On Sulphates of the Form  $\text{R}_2\text{SO}_4 \cdot 2\text{M}''\text{SO}_4$ , especially those of Isometric Crystallisation: F. R. Mallet.

RÖNTGEN SOCIETY, at 8.—Observations on Practical X-Ray Work, with Exhibition of Apparatus and Stereoscopic Skiagrams: Mackenzie Davidson.—Bullet in the Brain: J. Moore.

FRIDAY, DECEMBER 8.

ROYAL ASTRONOMICAL SOCIETY, at 8.

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